

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. **(Currently Amended)** A process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer comprising copolymerizing ethylene, an  $\alpha$ -olefin and a non-conjugated polyene in a hydrocarbon solvent with use of a ~~transition metal compound catalyst~~, a transition metal-containing polymerization catalyst comprising:

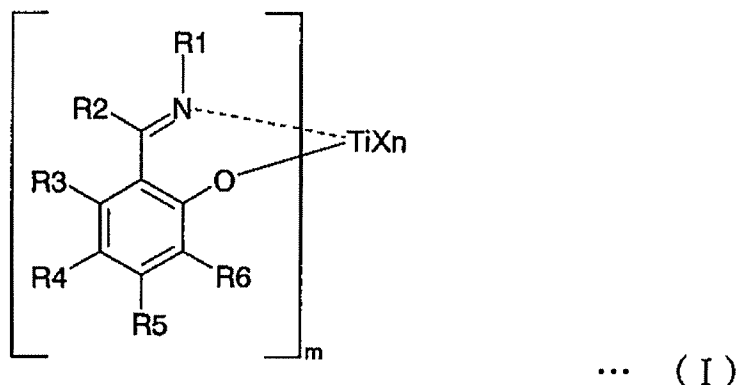
(A) a transition metal compound represented by the following formula (I); and

(B) at least one compound selected from (B-1) to (B-3):

(B-1) an organometallic compound;

(B-2) an organoaluminum oxy-compound; and

(B-3) a compound which reacts with the transition metal compound (A) to form an ion pair:



wherein:

m is an integer of 1 to 4;

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R1 to R5, which may be the same or different, are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group, or a tin-containing group;

R6 is a substituent group selected from (i.) aliphatic hydrocarbon groups in which the carbon bonded to the phenyl group shown in formula (I) is a primary, secondary or tertiary carbon, (ii.) alicyclic hydrocarbon groups in which the carbon bonded to the phenyl group shown in formula (I) is a primary, secondary or tertiary carbon, and (iii.) aromatic groups;

and two or more of the substituent groups R1 to R6 may be bonded to each other to form a ring;

when m is 2 or greater, two of the groups R1 to R6 may be bonded to each other, with the proviso that the groups R1 are not bonded to each other;

n is a number satisfying a valence of the titanium atom; and

X is a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group or a tin-containing group, and when n is 2 or greater, plural groups X may be the same or different and may be bonded to each other to form a ring,

and removing the unreacted monomers and the hydrocarbon solvent from the copolymer solution without removing the catalyst residue, wherein the copolymerization is carried out at a polymerization temperature of 100°C or above and a polymerization pressure of 2.7 MPa or

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above in a manner such that the non-conjugated polyene concentration in the polymerization solution is less than the maximum non-conjugated polyene concentration  $C_{\max}$  (mol/L) indicated below:

$C_{\max} = 0.050$  (mol/L) when the copolymer has an iodine value (IV) of 9.0 g/100 g to less than 17.0 g/100 g; or

$C_{\max} = 0.104$  (mol/L) when the copolymer has an iodine value (IV) of 17.0 g/100 g or above.

2. **(Currently Amended)** A process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer comprising copolymerizing ethylene, an  $\alpha$ -olefin and a non-conjugated polyene in a hydrocarbon solvent with use of the transition metal-containing polymerization catalyst according to claim 1, ~~of a transition metal compound catalyst~~, and removing the unreacted monomers and the hydrocarbon solvent from the copolymer solution without removing the catalyst residue, wherein the copolymerization is carried out at a polymerization temperature of 100°C or above and a combined vapor pressure of the hydrocarbon solvent and the unreacted monomers of 2.7 MPa or above in a manner such that the non-conjugated polyene concentration in the polymerization solution is less than the maximum non-conjugated polyene concentration  $C_{\max}$  (mol/L) indicated below:

$C_{\max} = 0.050$  (mol/L) when the copolymer has an iodine value (IV) of 9.0 g/100 g to less than 17.0 g/100 g; or

$C_{\max} = 0.104$  (mol/L) when the copolymer has an iodine value (IV) of 17.0 g/100 g or above.

3. **(Currently Amended)** A process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer comprising copolymerizing ethylene, an  $\alpha$ -olefin and a non-conjugated polyene in a hydrocarbon solvent with use of the transition metal-containing polymerization catalyst according to claim 1, ~~a transition metal compound catalyst~~, and removing the unreacted monomers and the hydrocarbon solvent from the copolymer solution without removing the catalyst residue, wherein the copolymerization is carried out at a polymerization temperature T (K) and a polymerization pressure  $P_a$  (MPa) in a manner such that the non-conjugated polyene concentration in the polymerization solution is less than the maximum non-conjugated polyene concentration  $C_{max}$  (mol/L) indicated below:

$$C_{max} = 0.050 \times \text{Iodine Value (IV)} \times 10^{\{12.25 + 1.16 \times \log P^a + 5.37 \times \log(1/T)\}}$$
 when the polymerization temperature is less than 353.16 K (80°C);

$$C_{max} = 0.050 \times \text{Iodine Value (IV)} \times 10^{\{11.88 + 1.23 \times \log P^a + 5.23 \times \log(1/T)\}}$$
 when the polymerization temperature is from 353.16 K (80°C) to less than 393.16 K (120°C); or

$$C_{max} = 0.050 \times \text{Iodine Value (IV)} \times 10^{\{19.02 + 1.61 \times \log P^a + 8.02 \times \log(1/T)\}}$$
 when the polymerization temperature is 393.16 K (120°C) or above.

4. **(Currently Amended)** A process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer comprising copolymerizing ethylene, an  $\alpha$ -olefin and a non-conjugated polyene in a hydrocarbon solvent with use of the transition metal-containing polymerization catalyst according to claim 1, ~~a transition metal compound catalyst~~, and removing the unreacted monomers and the hydrocarbon solvent from the copolymer solution without removing the

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catalyst residue, wherein the copolymerization is carried out at a polymerization temperature T (K) and a combined vapor pressure  $P_b$  (MPa) of the hydrocarbon solvent and the monomers in a manner such that the non-conjugated polyene concentration in the polymerization solution is less than the maximum non-conjugated polyene concentration  $C_{max}$  (mol/L) indicated below:

$$C_{max} = 0.050 \times \text{Iodine Value (IV)} \times 10^{\{12.25 + 1.16 \times \log P_b + 5.37 \times \log(1/T)\}}$$
 when the polymerization temperature is less than 353.16 K (80°C);

$$C_{max} = 0.050 \times \text{Iodine Value (IV)} \times 10^{\{11.88 + 1.23 \times \log P_b + 5.23 \times \log(1/T)\}}$$
 when the polymerization temperature is from 353.16 K (80°C) to less than 393.16 K (120°C); or

$$C_{max} = 0.050 \times \text{Iodine Value (IV)} \times 10^{\{19.02 + 1.61 \times \log P_b + 8.02 \times \log(1/T)\}}$$
 when the polymerization temperature is 393.16 K (120°C) or above.

**5. & 6. (Canceled)**

**7. (Currently Amended)** The process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer according to ~~any one of claims 1 to 6~~, claim 1, wherein the removal of the unreacted monomers and the hydrocarbon solvent is performed by evaporation.

**8. (Currently Amended)** The process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer according to ~~any one of claims 1 to 7~~, claim 1, wherein the content of residual unreacted polyene in the copolymer is not more than 500 ppm.

9. **(Currently Amended)** A process for producing an ~~ethylene/propylene/non-conjugated polyene~~ ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer according to ~~any one of claims 1 to 8,~~ claim 1, wherein the transition metal compound catalyst ~~is capable of catalyzing~~ catalyzes copolymerization of ethylene, propylene and a non-conjugated polyene to give an ethylene/propylene/non-conjugated polyene copolymer having an ethylene content of 70 mol% and an iodine value of at least 15, when the copolymerization is carried out under conditions such that the polymerization temperature is 80°C, a reactor is employed which includes a gas phase and a liquid phase, the ethylene and propylene of the gas phase have a combined partial pressure of 0.6 MPa or above, and the non-conjugated polyene of the liquid phase has a concentration of 15 mmol/L or below.

10. **(Currently Amended)** The process for producing an ethylene/ $\alpha$ -olefin/non-conjugated polyene copolymer ~~according to any one of claims 1 to 9,~~ obtained by the process of claim 1, wherein the transition metal content in the copolymer is not more than 20 ppm.

11. – 15. **(Canceled)**